(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) EP 0 727 756 A1

(12) EUROPEAN PATENT APPLICATION

(43) Date of publication:
21.08.1996 Bulletin 1996/34

(51) Int. Cl.[6]: **G06K 11/18**

(21) Application number: **95303448.5**

(22) Date of filing: **23.05.1995**

(84) Designated Contracting States:
DE ES FR GB IT PT

(30) Priority: **20.02.1995 JP 55071/95**

(71) Applicant: **Wacom Co., Ltd.**
Saitama-ken, 349-11 (JP)

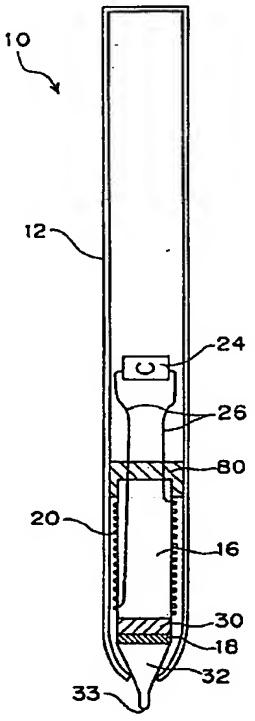
(72) Inventor: **Ogawa, Yasuji,**
c/o Wacom Co., Ltd.
Kitasaitama-gun, Saitama 349-11 (JP)

(74) Representative: **Beresford, Keith Denis Lewis et al**
BERESFORD & Co.
2-5 Warwick Court
High Holborn
London WC1R 5DJ (GB)

(54) Pressure sensitive arrangement and stylus pen

(57) A stylus which has a pressure sensitive arrangement for reliably sensing a depressing force although the stylus being slantingly disposed, by using inductance change generated from an interval displacement between a moveable magnetic body and a fixed magnetic body, which has a coil wounded around thereof and is disposed at a predetermined distance from said moveable magnetic body. The arrangement has a pen tip member having a contact portion for receiving the pen pressure; an elastic material member disposed between the moveable and fixed magnetic bodies; a first supporting device disposed to hold the position of the fixed magnetic body against a depressing pressure; and a second supporting device for supporting the depressing member in a condition established when the rear end plane of the moveable magnetic body and the front end plane of the fixed magnetic body are placed with each other in a parellel position by receiving the depressing pressure.

Fig. 2



EP 0 727 756 A1

Description

BACKGROUND OF THE INVENTION

1. Field of the Invention

This invention relates to the stylus used as a positional indicator in a coordinate input device, which is an input device of a computer system, normally called as a digitizer or tablet, and more particularly to a stylus that can detect pen touch pressure, or which comprises pen pressure sensitive mechanisms.

2. Description of the Prior Art

A stylus pen used as a positional indicator of the digitizer is normally provided not only to detect coordinates of indicated position but also to detect pen-down information, which means that its pen point is in touch condition with the position detecting surface. Generally, the method to detect the position is arranged to detect a depressing force loaded against a member provided at the top of the pen, which is the component transmitted along the axial direction of the pen.

First, the method for detecting position of the digitizer will be explained before describing the arrangement of the stylus. There are several positional detecting methods used in the digitizer, so one example using electromagnetic method in receiving/transmitting the information will now be described. It has combined arrangements of a positional detecting plane on which many sensor coils are positioned parallel with the direction of the positional detection, and a positional indicator such as a pen or cursor. Two arrangements are normally provided in X and Y directions by orthogonally positioning them to each other on the respective detecting plane to detect both in X and Y directions. A coil or resonant circuit is also provided to make electromagnetic interactive operations between sensor coils. To point out an example, electromagnetic waves are sent out from the sensor coil, and responsive electromagnetic waves, which are radiated again because of an interactive action between the resonant circuit within the positional indicator and the electromagnetic waves, are received at the sensor side. Operations including interpolations are performed based upon the signal received from the coil that has the most powerful signal strength and its neighboring coils, to decide the position thereof.

A feature of this electromagnetic receiving/transmitting method is that it can be fabricated, the positional indicators is a cordless device and has no need to equip a power source within the indicator. Detailed description of it can be referred to Japanese Patent Application laid open H2-53805 and H3-147012.

There is also another method for detecting position in which electromagnetic waves are sent out from a positional detecting plane and are received at corresponding positional detector, and a further simplified electromagnetic method in which electromagnetic waves are reversely sent out from a positional indicator with that of a former one, and are received at the positional detecting plane side.

The positional indicator, as mentioned above, using the electromagnetic interaction to detect the respective position, is provided with coils or resonant circuits within itself. Furthermore in that positional indicator of the stylus type, it realized these operations by changing resonant conditions of above-mentioned coils or resonant circuits from that of the stable conditions.

Several arrangements have therefore been proposed for the stylus, which was provided with a stylus pressure sensitive mechanism. For example, an arrangement was provided in which part of the inductance or capacitance of the resonant circuit or coil was replaced with a variable coil or capacitance, or to which a variable resistance was added so that these variable components were allowed to produce a certain change when applied the stylus pressure thereto. Reference should be made to the Japanese patent application Publication Laid-open Nos. S63-257823, S64-532222, H1-5322, H4-96212, and H5-275283.

Some prior art examples of the pressure sensitive styli are shown in Fig. 1A, Fig. 1B and Fig. 1C, in each of which a resonant circuit is built.

As for commonly provided structural components in three types of styli shown in Figs. 1A to 1C, it comprises a casing 12 having a cylindrical outer body, a core body 14 provided on the axis on the casing, a ferrite core 16 having a through-hole for slidable housing of the body 14, and coil 20 wound around the core 16, a movable magnetic body that can move in relation to the core, an elastic body or spring 22, and a condenser (capacitor) 24. The core body 14 has a generally cylindrical form, while its top neighboring portion touching the positional detecting plane has a tapered form such that the operation allows it to easily indicate a specified point. Other components such as switches optionally provided are not shown.

The principle of pressure detecting operation during the pen-down mode will now be described. The ferrite core 16 is fixed to pen casing 12. The body 14 moves backward along its axis by its depressing force when the pen top 32 is depressed against the positional detecting plane. The moveable magnetic body 18 is positioned to move in conjugation with the core body in any of the examples. The relative distance to the core 16 is therefore varied as the magnetic body 18 moves. In Figs. 1B and 1C, the symbol di indicates the initial gap (in case of any depressing force exists) between the core 16 and the magnetic body 18, while the coil 20 and the capacitor 24 form a resonant circuit. Conditions of this resonant circuit are determined such that the circuit resonates with the sensor coil through receiving and transmitting the electromagnetic waveforms between them. The inductance of the coil 20 can be changed when the gap between the core 16 and the magnetic body 18 is changed. It thus detects the depressing force against the pen top by sensing the

change in the resonant conditions of where the pen is placed.

In Fig. 1A, the magnetic body 18 is fixed onto the side wall of the core 14 so that it moves along with the core 14. In Fig. 1B, the body 18 is fixed to the rear end portion of the core 14 so that it moves in accordance with the axial movement of the core 14. In Fig. 1C, the magnetic body 18 is placed in front of the core 16 so that it is fixed in a manner to surround the core 14.

The feature common to each of the styli 10 of the prior arts shown in Figs.1A to 1C that the core body 14 has an structure in which it moves only in its axial direction. That is, in any of the examples, the core 14 moves only in a sliding manner through the hole of the core 16 of the fixed magnetic body. A sufficient gain is attained with this arrangement if the stylus 10 is operated in vertically standing condition against the positional detecting plane since the depressing force effects toward its central axis.

However, if the stylus 10 is operated in an inclined position against the detecting plane, the direction of the depressing force is then no more coincident with the axial direction of the body 14. In such a case, only the axial component of the depressing force is transferred to the body 14 so that the amount of the depressing force contributed to the detection is decreased. Thus, the inductance change generated by the displacement of the magnetic body is lowered. The sensitivity of the pen pressure detection is also lowered if the stylus is operated in inclined position so that it cannot detect a weaker pen pressure. If it is required to attain the same level of sensitivity as that of the pen orthogonally placed to the plane, although the pen is placed in inclined position, an increased depressing force would have to be exerted for the pen to get the same displacement of the core body, i.e., magnetic body as that of the aforementioned orthogonal position to the plane.

Normally, it is natural for an operator to hold the pen in inclined position rather than in orthogonal position when inputting onto a horizontal plane with the pen in hand.

To attain an increased absolute sensitivity by compensating such a defect, it is desirable to provide structure that uses the moveable magnetic body 18 having a larger area, and having its end face opposed to the face of the fixed magnetic body 16 such as shown in Fig. 1B rather than to use the body 18 having a smaller area shown in Fig. 1A. In Figs. 1B and 1C, it is however required to assemble the pen with the initial gap di predetermined as the interval between the two magnetic bodies when the pen is not depressed onto its tip. That means the high accuracy being required in placing the moveable body.

Ferrite material normally used for the fixed magnetic body is made through sintering so that its dimensional tolerance is low and thus it is difficult to ensure the accuracy mentioned above.

The second problem in operating the stylus with inclining position is that the friction encountered when the core body slids through the hole cut into the ferrite core, is that the pen pressure sensitivity is decreased. Also in this regard, it is required to operate while depressing the pen with much increased force if the pen is used in an inclined position.

Thus, in all regards, the operability of the stylus in an inclined position is low. Therefore, an input operation with a light operational feeling is not realized. This makes the operability lower, not only with the positional detecting device but also with the entire computer system.

SUMMARY OF THE INVENTION

It is an object of the present invention to provide a stylus that can ensure the detection of the pen pressure even when the pen is operated in an inclined position.

It is another object of the present invention to provide a stylus that can ensure detection of the pen pressure and to provide a light operational feeling even when the pen is operated in an inclined position.

For the purpose of accomplishing the aforementioned objects, the present invention provides a pressure sensitive arrangement of the following description, and another pressure sensitive arrangement in a stylus.

In the first aspect of the present invention, a pressure sensitive arrangement for sensing the depressing force by using inductance change, generated by an interval displacement between a first magnetic body and a second magnetic body, having a coil wounded around thereof comprises:

a depressing member having a contact portion for receiving the pen pressure and a rear end portion located on a substantially opposite side of the contact portion, at least the rear end portion forming a first magnetic body,

a second magnetic body having a coil wound around it which is disposed to its front end plane being located at a predetermined distance from a rear end plane of the rear end portion forming the first magnetic body,

an elastic material member disposed between the rear end portion formed by the first magnetic body and the front end plane of the second magnetic body,

first supporting means disposed so as to hold the position of the second magnetic body against the pen pressure which is transferred from the depressing member and the elastic member, and

second supporting means for supporting the depressing member which is established when the rear portion, forming the first magnetic body, and the front end plane of the second magnetic body are placed with each other not in a parallel position by receiving the pen pressure and others.

Here, the pressure sensitive arrangement, may further comprise a support adjustment structure for adjusting the position of the second supporting means, the second supporting means being allowed to move forward and backward with the depressing member being

held in contact state, so that the rear end plane of the rear end portion forming the first magnetic and the front end plane of the second magnetic body being held parallel to each other, and may determine the initial gap between these two end planes when the pen is free from its depressing force.

The pressure sensitive arrangement, wherein the depressing member may be comprised of a tapered member including the contact portion, and a flat plate formed by a first magnetic body.

In the second aspect of the present invention, a pressure sensitive arrangement for sensing the depressing force by using a change of an inductance generated by an interval displacement between a first magnetic body and a second magnetic body having a coil wound around thereof in a stylus that comprises a cylindrical pen casing and an electrical resonant circuit, the stylus comprises:

a depressing member having a contact portion for receiving the pen pressure and a rear end portion located on a substantially opposite side of the contact member, the rear end portion forming a first magnetic body,

a second magnetic body having a coil wound around which is disposed to its front end plane being located at a predetermined distance from a rear end plane of the rear end portion forming the first magnetic body,

an elastic material member disposed between the rear end portion formed by the first magnetic body and the front end plane of the second magnetic body,

first supporting means disposed so as to hold the position of the second magnetic body against the pen pressure and others which are transferred from the depressing member and the elastic member, and

second supporting means for supporting the depressing member in a condition established when the rear end portion forming the first magnetic body and the end plane of the second magnetic body are placed with each other not in a parellel position by receiving the pen pressure.

Here, the pressure sensitive arrangement in a stylus, may further comprise a support adjustment arrangement for adjusting the position of the second supporting means, the second supporting means being allowed to move forward and backward with the depressing member being held in a contact state, so that the rear end plane of the rear end portion forming the first magnetic and the front end of the second magnetic body are held parallel to each other, and determines the initial gap between these two end planes when the pen is free from its depressing force.

The pressure sensitive arrangement in a stylus, wherein the depressing member may be comprised of a tapered member including the contacting member and a plate formed by the first magnetic body.

In the third aspect of the present invention, a stylus comprising a cylindrical pen casing and an electrical resonant circuit, and having a pressure sensitive structure for sensing the depressing force by using a change of an inductance generated by an interval displacement between a first magnetic body and a second magnetic body having a coil wound around thereof, wherein the stylus comprises:

a depressing member having a contact portion for receiving the pen pressure and a rear end portion located substantially opposite side of the contact member, the rear end portion forming a first magnetic body,

a second magnetic body having a coil wound around which is disposed to its front end plane being located at a predetermined distance from a rear end plane of the rear end portion forming the first magnetic body,

an elastic material member disposed between the rear end portion forming the first magnetic body and the front end plane of the second magnetic body,

first supporting means disposed so as to hold the position of the second magnetic body against the pen pressure which is transferred from the depressing member and the elastic member, and

second supporting means for supporting the depressing member in a condition established when the rear end plane of the rear end portion forming the first magnetic body and the front end plane of the second magnetic body are placed with each other not in a parellel position by receiving the pen pressure.

Here, the second supporting means may be comprised of a peripheral portion of an opening of the casing, and at least part of the peripheral portion comprising the second supporting means by contacting the depressing member.

The stylus, may further comprise a support adjustment structure for adjusting the position of the second supporting means, the second supporting means being allowed to move forward and backward with the depressing member being held in contact state, so that the rear end plane of the rear end portion forming the first magnetic and the front end of the second magnetic body are held parallel to each other, and may determine the initial gap between these two end planes when the pen is free from its depressing force.

The depressing member may be comprised of a lock mechanism for fixing the support adjustment structure to hold a distance between the two magnetic bodies, which is defined by the supporting structure.

The depressing member may be comprised of a tapered member including the contacting member and a plate formed by the first magnetic body.

The elastic material member may be comprised of a diaphragm, which is fabricated by a film of a convex shape.

The elastic material member may be comprised of a rubber sheet.

The depressing member may be comprised of a tapered member including the contacting member and a plate forming the first magnetic body, and

the second supporting means may be comprised of a suspending rod for coupling the rear plane of the

pen point member and the front panel of the second magnetic body, and

the suspending rod may be threaded through a penetrating hole provided in the first magnetic body and the elastic material member, and be assembled by loading a predetermined tension thereon such that the rear end plane of the rear portion of the first magnetic body and the front end of the second magnetic body are being held parallel to each other, and determines the initial gap between these two end planes when the pen is free from its depressing force.

The suspending cord may be formed integrally with the pen tip member.

The suspending cord may be fabricated by thread.

The depressing member may be comprised of a tapered member including the contacting member and a plate forming the first magnetic body,

the second supporting means comprises a suspending rod for coupling the rear plane of the pen point member and the front panel of the second magnetic body, and

the suspending rod is threaded through a penetrating hole provided in the first magnetic body and the elastic material member, and be assembled by loading a predetermined tension thereon such that the rear end plane of the rear portion of the first magnetic body and the front end of the second magnetic body are held parallel to each other, and determines the initial gap between these two end planes when the pen is free from its depressing force.

The suspending rod may be formed integrally with the pen tip member.

The suspending rod may have a stopper mechanism, and the second magnetic body may have a ring shaped as a flat plate covering a cavity drilled in the front end of the second magnetic body and an opening of the cavity, and the suspending rod may be coupled to the second magnetic body in a condition in which the stopper mechanism is threaded through the ring of the flat plate provided in the second magnetic body.

The elastic material may be formed by ferrite rubber, into which a magnetic material is dispersed.

In the fourth aspect of the present invention, the stylus comprising a cylindrical pen casing and an electrical resonant circuit, and having a pressure sensitive structure for sensing the depressing force by using a change of an inductance generated by an interval displacement between a first magnetic body and a second magnetic body having a coil wounded around thereof, wherein the stylus comprises:

a pen tip member having a contact portion for receiving the pen pressure and a rear end plane located on the substantially opposite side of the contact portion,

a second magnetic body having a coil wound around it which is disposed so its front end plane is located at a predetermined distance from a rear end plane of the pen tip member,

a elastic material member, into which magnetic material is dispersed to form a first magnetic body, disposed between the rear end plane of the pen tip member and the front end plane of the second magnetic body,

a first supporting means disposed to hold the position of the second magnetic body against the pen pressure that is transferred from the pen tip member and the elastic member, and

second supporting means for supporting the pen tip member in a condition established when the rear end plane of the pen tip and the end plane of the second magnetic body are placed with each other not in a parellel position by receiving the pen pressure.

Here, the elastic material member, into which the magnetic material is dispersed, may be comprised of ferrite rubber.

In the fifth aspect of the present invention, the stylus comprising a cylindrical pen casing and an electrical resonant circuit, and having a pressure sensitive structure for sensing the depressing force by using a change of an inductance generated by interval displacement between a first magnetic body and a second magnetic body having a coil wound around thereof, wherein the stylus comprises:

a pen tip member having a contact portion for receiving the pen pressure and a rear end plane located on the substantially opposite side of the contact member,

a second magnetic body having a coil wound around it which is disposed to its front end plane being located at a predetermined distance from a rear end plane the pen tip member,

a plurality of magnetic discs, each of which is connected by elastic adhesive to compose a first magnetic body, disposed between the rear end plane of the pen tip member and the front end plane of the second magnetic body,

first supporting means disposed to hold the position of the second magnetic body against the pen pressure that is transferred from the pen tip member and the plurality of the magnetic discs, and

supporting means for supporting the pen tip member in the condition established when the rear plane of the pen tip member and the front end plane of the second magnetic body are placed in each other not in a parellel position by receiving the pen pressure.

In the sixth aspect of the present invention, the stylus comprising a cylindrical pen casing and an electrical resonant circuit, and having a pressure sensitive structure for sensing the depressing force by using a change of an inductance of a coil wound around a magnetic body, wherein the stylus comprises:

a pen tip member having a contact portion for receiving the pen pressure and a rear end plane located on the substantially opposite side of the contact member,

a plurality of magnetic cylinders having a coil wound around thereof, the cylinders being disposed so as to contact with the rear end plane of the pen tip member, and connected by elastic adhesive to each other,

first supporting means disposed to hold the position of the cylinder disposed at the further most rear end of the cylinders against the pen pressure transferred from the pen tip member and the plurality of the magnetic cylinders, and

second supporting means for supporting the pen tip member in a condition established when the rear plane of the pen tip member and the end planes of the cylinders are placed with each other not in a parellel position by receiving the pen pressure.

The stylus having the pressure sensitive structure such as provided in the stylus according to the present invention senses the pen pressure using the inductance change generated in its coil wound around a magnetic body. The pressure sensitive structure of the present invention comprises of the elastic member, which is interposed between the depressing member and the second magnetic body, the depressing member transferring the pressure via the rear end portion forming the first magnetic body upon receiving the pressure. The second magnetic body is supported by the first supporting means against the depressing force, and thus remained fixedly at its position.

The depressing member is thus allowed not only to make some displacement along its axial direction but also to decline to the axis. If any change such as to decline to this axis takes place, the second supporting means supports the depressing member in a declined position. The gap between the first magnetic body forming the rear end portion of the depressing member and the second magnetic body fixed at its position is changed, and that causes the inductance value of the coil wound around the second magnetic body to change.

According to the structure of the present invention as explained above, the gap between the magnetic bodies can easily and sufficiently be changed even though the inclined pressure force is applied to the pen.

Furthermore, according to the present invention, it comprises the support adjustment mechanism to make an adjustment to the position of the second supporting means so that the initial gap between the first and second magnetic bodies is defined. Thus, even a slight change from the initial gap can be sensed, and that can make it such that a weak pen pressure can be detected. Furthermore, it results to load the elastic material portion with an initial pressure which prevents play between components of the pen.

Furthermore, according to the present invention, it comprises the lock mechanism for the support adjust structure so that each component can be held at the respective adjusted position.

The second supporting means can be realized by using the tip of the pen casing, or by using the cord or rod to tie or couple the pen tip member and the second magnetic body.

Also, the according to the present invention, the elastic material member can be eliminated by providing bonding layers formed by elastic bond material if the moveable or fixed magnetic bodies are fabricated using a plurality of magnetic discs or cylinders. Further, the pen pressure can be sensed with a high sensitivity since such a structure having a plurality of fragments coupled by an elastic material layer can smoothly move in response to the pressing force to the tip. Furthermore, variation of the thickness of each of the bonding layers can be averaged since a plurality of bonding layers exists.

The above and further objects and novel features of the invention will more fully appear in the following detailed description when it is read in connection with the accompanying drawings. It is to be expressly understood, however, that the drawings are for the purpose of illustration only and are not intended as a definition of the limits of the invention.

BRIEF DESCRIPTION OF THE DRAWINGS

A preferred form of the present invention is illustrated in the accompanying drawings in which:

Fig. 1A, Fig. 1B and Fig. 1C is a stylus that can detect pen pressure of a prior art, respectively;
Fig. 2 is a sectional diagram of an embodiment of a stylus according to the present invention;
Fig. 3A and Fig. 3B are sectional views illustrating pen-down operation of the embodiment of the pen shown in Fig. 2, respectively;
Fig. 4 is a sectional view illustrating another embodiment according to the present invention;
Fig. 5 is a sectional view of components of a pressure sensitive structure for holding components without play showing another embodiment of the present invention;
Fig. 6 is a sectional view employing similar holding way with that of Fig. 5 illustrating another example of the present invention;
Fig. 7 is a partial sectional view of a stylus illustrating another embodiment of the present invention;
Fig. 8A and Fig. 8B are partial sectional views of a stylus illustrating still another embodiment of the present invention, respectively;
Fig. 9A and Fig. 9B are partial sectional diagrams of a stylus illustrating still another embodiment of the present invention, respectively.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

This invention will be described in further detail by way of example with reference to the accompanying drawings.

An embodiment of a stylus 10 according to the present invention is shown in Fig. 2. In this specification, referring to "front/side" or "tip /side" means to indicate a pen point, while "rear/side" or "rear end/side" means to indicate to opposite end of the pen point.

The stylus 10 has a cylindrical shape of a pen casing 12 as for an outer casing, which is formed by non-metallic material such as synthetic resin. The cylindrical shape of the pen casing 12 is designed to simulate of a normal writing tool considering of human action. Therefore, the casing has a tapered shape and a hole 13 is made at the pen point to thread a core body e.t.c.. The principle of the pen pressure sensing structure of the stylus 10 shown in Fig. 2 is to sense any inductance change caused by the gap change between ferrite core 16 (fixed magnetic body) around which a coil 20 is wounded and a moveable magnetic body 18. Thus, application of pen pressure to the pen point causes the resonant conditions of a resonant circuit comprising the coil 20 wounded around a ferrite core 16 and a capacitor 24 connected via a wire 26 to the coil 20 to change.

To simplify, the detailed portions of the resonant circuit including are eliminated in Fig. 2. For example, a normal stylus has at least one mechanical switch mounted on it to get several switch information, and an additional coil or capacitor e.t.c. is connected to the resonant circuit to change its resonant conditions by turning on the switch. It is preferable to apply the present invention to a stylus that is so called as a cordless type without having any power supply, but the present invention may also be applied to such a type of stylus with a cord or power supply. An electronic circuit equipped in a stylus according to the present invention may be constructed only with passive components, or provided with active components in order to add another capability.

In the embodiment shown in Fig. 2, a pen point member 32 is provided rather than a core body of the prior art in order to transfer a depressing force or pen pressure. The pen point member 32 generally has a similar shape with that of the prior art core body. That is, it is preferable that a contact portion 33 is in contact with its position detect plane at a single point. Therefore, in regard to its pen top shape, it is preferable to have a tapered shape which is gradually decreasing its diameter to the top, or a cylindrical shape in which one cylinder is connected at its top to another cylinder of a bigger diameter, or a combination thereof. The contact portion 33 is externally protruding from a opening 13 drilled in the casing 12. The end plane at the read side of the pen point member 32 has a flat surface vertical to the axis of the member.

In the embodiment shown in Fig. 2, a moveable magnetic body 18 is fixed to the rear end plane of the member 32, by which the member 32 and the body 18 move together. Furthermore, in the embodiment shown in Fig. 2, the body 18 is a plate having a predetermined thickness, or preferably it is a disc and the end plane of its front side has the same shape as the rear end plate of the member 32. Bonding these two end plates together can be provided, for example, by applying an ordinal adhesive material between them. This integrated member is defined as a depressing member detailed in the following.

Furthermore, according to the present invention, an elastic material member 30 is inserted between the moveable magnetic body (the first magnetic body) 18 and the ferrite core (the second magnetic body) 16, and the first and second magnetic bodies are coupled with the member 30. According to the embodiment shown in Fig. 2, the member 30 is also a flat plate, or more preferably, disc having a predetermined thickness. Preferably, the material used for member 30 is a sheet of various rubber, such as used for cushion. Particularly, material that is easily controllable in thickness at manufacturing stage is preferred. The front end plane of the member 30 has preferably the same shape as the rear end of the magnetic body 18. The read end plane of the member 30 also has the same shape as the rear end of the magnetic body 16. The rear end of the moveable magnetic body 18 and the front rear end of the member 30; and the rear end of the member 30 and the front end of the ferrite core 16 can be bonded together respectively using an ordinary adhesive.

The ferrite core or fixed magnetic body 16 is fixed to the pen casing 12 in ordinary manner. Various arrangement can be applied to fix the core 16, and thus an example can be considered in which the rear end of core 16 and the pen casing 12 are connected by using fixing holder 80 as shown in Fig. 2. In the present invention, the core 16 has a cylindrical shape, in which any through hole is provided since the body core does not penetrate the core.

As mentioned above, the stylus 10 of this example shown in Fig. 2 has a pen point member 32, the moveable magnetic body 18, an elastic material member 30 and the fixed magnetic member 16 positioned sequentially as mentioned on the central axis of the pen casing 12, and bonded them each other.

Fig. 3A and Fig. 3B are illustrations of a pen-down operation of the stylus 10 shown in Fig. 2. Fig. 3A is the enlarged sectional view of the top portion of the stylus 10 shown in Fig. 2 before the pen is put down, without any depressing force being applied to the pen. In the figures, although the peripheral portion of the opening 13 in the casing 12 is shown to be in touch with the pen poet member 32, some degree of gap may also be allowed. During no depressing force being applied to the pen, the first end plane 22 between the magnetic body 18 and the member 30, and the second end plane 230 between the member 30 and the ferrite core 16 are parallel in each other, which mean the member 30 to have a constant thickness. The contact point 33 receives a depressing force f0 from a position detecting plane 50. The depressing force f0 can be divided into components f1 and f2, the former is parallel to the axis of the pen, and the latter is vertical to the axis. The component f1 parallel to the axis is transferred to the core 16 via the magnetic body 18 and the core 16. The core 16 is fixed to the casing 12 by using a holder 80 and others, and thus supported to it against the depressing force (a first supporting means). It results that a compressing force acts upon the elastic material member 30.

Furthermore, the component f_2, which is vertical to the axis of the depressing force f_0, is applied to the pen point 32 toward its direction so that the pen point 32 declines along the axis of the pen 10 as shown. The declined pen point 32 is in contact with an edge portion 300 of the opening 13 of the pen casing 12, and thus the point is supported by the peripheral portion against the depressing force f_2 (a second supporting means). The elastic material member 30 receives a depressing force that biases one side of the member as the pen point member 32 is declined. It results that both ends of the elastic material member 30 are compressed without in parallel with each other. This means that the distance between the ferrite core 16 and the magnetic body 18 is decreased so that the inductance of coil 20 wound around the core 16 changes its value.

As shown by this example, the stylus according to the present invention is arranged such that the pen point member 32, which is receiving the depressing force, moves not only by the force in parallel with the pen axis, but also by the force in vertical with the pen axis, thus the depressing force can be changed to a more effective displacement value, i.e., to a positional change. Furthermore, since the elastic material member 30 is disposed between the moveable magnetic body 18 and the fixed magnetic body 16, the displacement of the pen point member 32 is transferred as the displacement of the member 30. In this way, the displacement between the moveable magnetic body 18 and the fixed magnetic body 16 can be changed significantly, although the pen is placed in inclined position.

It should be noted that according to the embodiment the deformed portion by the depressing force is a member integrated by bonding the pen point member 32 and the variable magnetic body 18 together. Hire these two portions are made into a single integrated portion, and it is defined as a depressing member. Between these two portions, it does not necessarily to be bonded with flat faces as shown in the figure. For example, irregularity can be provided on both of surfaces to be bonded respectively to help the adhesive property. The depressing member shown in Fig. 2 can be a member that has contact portion contacting with the position detecting plane at its top side, and has a flat face of a magnetic body at its rear side.

The elastic material member 30 can be selected for its thickness and hardness e.t.c. in corresponding with a required pen pressure sensitivity and pen displacement features. For instance, preferably it can be a thin and flexible material since the displacement of the pen point member is required to be small, while the detection sensitivity is required to be high. A flexible silk or nylon texture is preferred. The elastic material member 30 can also be available to get a stable pen pressure feature if it is fabricated by a rubber sheet.

Another embodiment of the stylus according to the present invention is shown in Fig. 2. In the embodiment show in Fig. 2, each of elements of the pressure sensitive structure according to the present invention is bonded using a certain adhesive, however a bonded portion can be separated if a distortion shown in Fig. 3A and Fig. 3B are repeatedly made over a long period of time, or an excessive strong force is loaded. Therefore, in another embodiment shown in Fig. 4, it is provided with a support adjustment structure 34 for externally supporting the pen point member 34. The support adjustment structure 34 is arranged to fully use an edge portion 300 of an opening of the casing 12 shown in Figs.3A and 3B as a supporting means of the pen point member 32. The structure 34 has an arrangement that allows to move the edge portion 300 before and behind along to the pen axis.

The support adjustment structure 34 comprises of a cylinder portion threaded on its inner wall, and a tapered portion having the opening at the top and an edge portion 300 of the opening. The structure 34 has a thread groove on the cylindrical portion of its internal wall threaded with the screw provided on the outer shell of the casing 12 to attach to it. Then driving the screw to move forward or backward the edge portion 300 of the pen point. The opening diameter at the pen point of structure 34 is selected to be smaller that the maximum diameter of the pen point portion 32.

As the structure moves backward, the pen point portion 32 comes to be pushed backward by the edge portion 300 of the opening 13 of the support adjustment structure 34. That is the condition with which the pen tip member 32 is held with a predetermined initial pressure. In this way, the predetermined pressure is applied to the member 32 so that no gap is produced between the elements, i.e., no looseness existed between them. If there is any looseness existed, then a very small pen pressure cannot be detected.

The initial pressure is the pressure imposed to the elastic body during no pen pressure-state, ideally the initial pressure is set to substantially to zero in order to make the initial pressure as high as possible. It is preferable to provide a lock mechanism 36 for locking the position of the support adjustment structure 34 from moving after initial pressure adjustment completed. The lock mechanism 36 has a cylinder threaded into a screw slot on the outer wall of the pen casing the same as that of the adjustment structure 34. The lock mechanism 36 is also positioned behind the adjustment structure 34. In locking, first the position of the adjustment structure 34 is determined, then the lock mechanism 36 is advanced to fasten by turning itself until its front end touches with the rear end of the adjustment structure 34 so that the position of the adjustment mechanism 36 is locked or held.

Further, another embodiment for holding the components of the pressure sensitive structure according to the present invention is shown in Fig. 5. In Fig. 5, a flexible suspend cord 38 connect between the pen point member 32 and the ferrite core 16. One end of suspend cord 38 is fixed to the center of front end of the ferrite core 6. The suspend cord 38 is thus positioned on the center axis of the pressure sensitive structure. In

assembling as described above, the length of the cord 38 is designed such that the cord is loaded with a suitable tension. It results that the pen top member 32 and the ferrite core 16, and the magnetic body 18 and the elastic member 30 lying between them are held with a suitable initial gap and initial pressure, and these end planes are held in parallel with each other. According to this embodiment, the elements can hold at their positions without looseness although their manufacturing accuracy such as in the thickness is not sufficiently high, since the center axis of the assembled pressure sensitive structure is fixed.

More specifically, as shown, holes for threading the suspend cord 38 are made to the pen point member 32 and the ferrite core 16 respectively, and then the threaded holes with cord 38 are filled with an adhesive to fix them together. In both of the magnetic body 18 and the elastic member 30 lying between the pen top member 32 and the ferrite core 16, a center hole through which the suspend cord 38 can be threaded and be slidable is provided respectively, when the holding method is carried out as shown in Fig. 5.

Preferably, the suspend cord 38 may have a flexible characteristic and certain degree of elasticity. Another fabricating method for the cord 38 is that molding synthetic resin may be used to mold the cord and the pen point member integrally, and to form a pen tip member with a suspend cord, and to bond only one end of which with the ferrite core 16.

It should be noted in the embodiment shown in Fig. 5 that when the suspend cord 38 is loaded with pen pressure, i.e., a force that is to compress the suspend cord 38 is applied to it, the suspend cord 38 does not effect to resist. That is, it is important to have for the suspend cord 38 a characteristic of easily flex itself in response to the applied pen pressure. If the suspend cord 38 itself effects reaction during the pen pressure is applied, the pen pressure is not sufficiently transferred to the elastic material member 30 resulting the decrease of sensitivity of the pen sensitivity. If a directionally inclined, pen pressure is applied, then the opposite side of the magnetic body 18 (the proximity side to the positional detection plane 50 as shown in Fig. 3) is moved away from the magnetic body 16, which result to decrease a degree of the average compression deformation of the elastic material member is decreased so that the displacement of between the magnetic bodies is decreased.

Therefore, as for detailed example of the suspend cord 38, it can be cited a highly strength plastic product such as fishing line. This line is strong, thin and flexible, and has a certain degree of elasticity that make assembly to ease.

Another embodiment employing holding method is shown in Fig. 6, which is similar to Fig. 5. According to the embodiment shown in Fig. 6, a suspend rod 39 is used instead of suspend cord. One end of the suspend rod 39 is fixed to the rear end plane center of the pen point member 32. These portions can be bonded together, or integrated with the pen point member 32. The other end of the suspend rod 39 provides a stopper mechanism 40. The front end of the ferrite core 16 provides a cavity 41 as shown, and to its opening a ring shaped plate so called "washer" 42 is fixed, which has a hole of slightly larger than that of the suspend rod 39. A center hole, through which the suspend rod 39 is penetrating, is drilled in the magnetic body 16 and the elastic material member 30.

In assembling, the suspend rod 39 fixed to the pen point member 32 is thread through by the magnetic body 18 and the elastic material member 18, and then the tip of the suspend rod 39 is threaded through the washer 42 such that the stopper mechanism 40 is positioned within the cavity 41 of the ferrite core 18. The stopper mechanism 40 is a general purpose mechanism through which a protruded portion thereof can enter or exit by a spring device for example. When the protruded portion of the stopper mechanism 40 passes through each hole of components, the protruded portion is housed in the suspend rod 39 so that it can be smoothly passed by. Once it passes, the protruded portion becomes in protruded state, so that the suspend rod 39 cannot more pass through the ferrite core 16, even if tried to extract the suspend rod 39 in reverse direction. Considering this assembled initial condition, the length of the suspend rod 39 and the position of the stopper mechanism are designed to load the rod 39 with suitable tension. It results that when no pen pressure is applied to the pen, the pen point member 32 and the ferrite core 16, and the magnetic body 18 and the elastic material member 30 lying between them are held with a suitable initial gap and pressure, and the end planes of them are held in parallel with each other.

When the pen pressure is applied in the embodiment shown in Fig. 6, the suspend rod 39 can move either to the axial direction of the pen casing 12 or an inclined direction from its axis. The suspending rod 39 can move toward axial direction since the cavity 41 of the ferrite core 18 has allowance toward depth. The rod 39 also can move toward an inclined direction since the hole diameter of the washer 42 is larger than that of the suspend rod 39. In this way, satisfactory detection of the pen pressure can be attained, although the stylus according accordance to the arrangement shown in Fig. 6 is inclined.

Next, a partial sectional diagram of a stylus of another example according to the present invention is shown in Fig. 7. In Fig. 7, a diaphragm is used which is fabricated into convex form using a film such as a rubber sheet instead of a flat disc type sheet as to the elastic material member 30 shown in Fig. 2 or 4. The structural feature of this diaphragm is that, when the pen pressure is applied to the pen, the retracting distance of the pen tip member is lengthened since the convex portion is provided. This means that the pen seems to have a long stroke for its user. An additional feature of this structure is that the convex portion is collapsed, and thus the pen tip member is retracted only

when more than a predetermined pen pressure is loaded to it. This means that the pen gives its user a click reaction. In this manner, several pen pressure feeling can be provided by deforming the form of the elastic material member, which results to give its user an agreeable operability.

A partial sectional diagram of a stylus of further example according to the present invention is shown in Fig. 8A and Fig. 8B. The example shown in Fig. 8A, a ferrite rubber 330 is used as an elastic material member into which magnetic material is dispersed. In this arrangement, the ferrite rubber 330 serves to the inductance change by its deformation, and it can further increase its pen pressure sensitivity. According the embodiment shown in Fig. 8B, the sensitivity may be decreased because of the inductance change produced only by the ferrite rubber 330, its required cost may however be decreased because of elimination of the movable magnetic body.

A partial sectional diagram of a stylus of further example according to the present invention is shown in Fig. 9A and Fig. 9B. The example shown in Figs.9A and 9B have an arrangement using both of the elastic property and the adhesive property by replacing the elastic material member with adhesive of elastic property. In Fig. 9A, the moveable magnetic body 18 comprises a plurality of magnetic discs 18a, 18b and 18c and between their end planes are connected with each other using elastic adhesive 250. Elastic adhesive material and other adhesive material can be used for bonding between the magnetic disc 18c and the pen tip member 32; and the magnetic disc 18a and the ferrite core 16. In this way, the moveable magnetic body 18 is formed by laminated material body whereby a plurality of bonding layers 250 is provided, each of which uses elastic adhesive material, and variations in thickness of the bonding layers and in mechanical property are decreased. This is particularly beneficial in mass production of the pen. Also, by providing a plurality of elastic connecting members, the operability of the tip of the pen can be increased, and allowed to respond sensitively to delicate pen pressure the displacement. Separation becomes difficult to occur since the distortion imposed upon the bonding portion is dispersed. The number of the magnetic discs is of course not limited to three as shown, but suitable selected.

In the embodiment shown in Fig. 9B, any separate moveable magnetic body is not provided for the ferrite core 16, but alternatively it comprises a plurality of the magnetic cylinders 16a, 16b and 16ca, and each of the magnetic cylinders is connected with each other by using elastic adhesive 250. The top side of the magnetic cylinder 16c is connected to the pen tip member 32 by using elastic adhesive 250, and the rear side end of the magnetic cylinder 16a is fixed to the pen casing 12 by using such as the fixing holder 80. Further, the coil 20 is wounded over the divided ferrite cores. In this arrangement, when the pen pressure is imposed to the pen, each of bonding layers 250 fabricated by elastic adhesive is compressed or distorted to change the gaps between the magnetic cylinders. The inductance of the coil result to change and thus to detect the pen pressure. This case also has effects to average the variation in thickness of the bonding layers 250, and to decrease the variation in the property. The number of the magnetic cylinders is not limited to three shown, is suitably selected.

The present invention comprises the pressure sensitive structure using the change of the gap between the fixed magnetic body and the variable magnetic body, said change being caused by the depressing force, wherein the elastic material member is lying between the end plates facing each other of the fixed magnetic body and the moveable magnetic body, the moveable magnetic body can be displaced with sufficient degree even although the depressing force is effected to the pen from an inclined axis. Thereby, the present invention can realize a pressure sensitive structure that ensures to detect the depressing force without influenced with its direction.

Also, the stylus comprising the pressure sensitive structure according the present invention, a light touch operation can be provided without need to effect excessive force specifically, although the slanted pen-down operation is performed. Furthermore, the pressure sensitive structure according the present invention can be provided with a low cost since it has a simplified structure.

Also, the stylus having the pressure sensitive structure according the present invention can easily realize the most suitable pen pressure and pressure displacement characteristics, since several materials can be selected as an elastic material in regard to its thickness and hardness.

The stylus having the pressure sensitive structure according the present invention comprises a support adjustment structure, which can control the initial gap and initial pressure between the fix magnetic body and the variable magnetic body with fine adjustment to a respective predetermined value so that it can guarantee a stable operation during its use by performing fine adjustment to eliminate looseness before its usage. Furthermore, the stylus according the present invention can detect a delicate pen touch such as the pen tip slightly touching to position detecting plane.

The stylus having the pressure sensitive structure according the present invention can assemble the pen tip member and the fixed magnetic body with the minimum looseness at the pen tip member, by coupling the suspend cord or rod along its center axis, although their manufacturing accuracy such as in the thickness is not sufficiently high. Then, the stylus according the present invention can also detect a delicate pen touch.

In the arrangement wherein the magnetic body comprises a magnetic body that is constructed with a plurality of assembled components, each connected using an elastic adhesive, the elastic material member can be eliminated, and the variation in thickness is aver-

aged since it has a plurality of bonding layers, and thus a property-stabilized-stylus can be provided.

Although the present invention has been described in its preferred form, it is understood that the present disclosure of the preferred form has been changed in the details of construction and the combination and arrangement of parts may be resorted to without departing from the spirit and the scope of the invention as hereinafter claimed.

Claims

1. A pressure sensitive arrangement for sensing the depressing force by using inductance change generated by an interval displacement between a first magnetic body and a second magnetic body having a coil wounded around thereof comprising:

   a depressing member having a contact portion for receiving said pen pressure and a rear end portion located on the substantially opposite side of said contact portion, at least said rear end portion forming a first magnetic body,

   a second magnetic body having a coil wounded around which is disposed to its front end plane being located at a predetermined distance from a rear end plane of said rear end portion forming said first magnetic body,

   a elastic material member disposed between said rear end portion formed by said first magnetic body and said front end plane of said second magnetic body,

   first supporting means disposed so as to hold the position of said second magnetic body against the pen pressure which is transferred from said depressing member and said elastic member, and

   second supporting means for supporting said depressing member which is established when said rear portion forming said first magnetic body and said front end plane of said second magnetic body are placed with each other not in a parellel position by receiving said pen pressure and others.

2. The pressure sensitive arrangement as claimed in Claim 1, further comprising a support adjustment structure for adjusting the position of said second supporting means, said second supporting means being allowed to move forward and backward with said depressing member being held in contact state, so that said rear end plane of said rear end portion forming said first magnetic and said front end plane of said second magnetic body are held parallel to each other, and determines the initial gap between these two end planes when the pen is free from its depressing force.

3. The pressure sensitive arrangement as claimed in Claim 1, wherein said depressing member comprises a tapered member including said contact portion, and a flat plate formed by a first magnetic body.

4. A pressure sensitive arrangement for sensing the depressing force by using a change of an inductance generated by an interval displacement between a first magnetic body and a second magnetic body having a coil wound around thereof in a stylus that comprises a cylindrical pen casing and an electrical resonant circuit, said stylus comprising:

   a depressing member having a contact portion for receiving said pen pressure and a rear end portion located substantially opposite side of said contact member, said rear end portion forming a first magnetic body,

   a second magnetic body having a coil wound around which is disposed to its front end plane being located at a predetermined distance from a rear end plane of said rear end portion forming said first magnetic body,

   an elastic material member disposed between said rear end portion formed by said first magnetic body and said front end plane of said second magnetic body,

   first supporting means disposed so as to hold the position of said second magnetic body against the pen pressure and others which are transferred from said depressing member and said elastic member, and

   second supporting means for supporting said depressing member in a condition established when said rear end portion forming said first magnetic body and said end plane of said second magnetic body are placed with each other not in a parellel position by receiving said pen pressure.

5. The pressure sensitive arrangement in a stylus as claimed in Claim 4, further comprising a support adjustment arrangement for adjusting the position of said second supporting means, said second supporting means being allowed to move forward and backward with said depressing member being held in contact state, so that said rear end plane of said rear end portion forming said first magnetic and said front end of said second magnetic body are held parallel to each other, and determines the initial gap between these two end planes when the pen is free from its depressing force.

6. The pressure sensitive arrangement in a stylus as claimed in Claim 4, wherein said depressing member comprises a tapered member including said contacting member and a plate formed by said first magnetic body.

7. A stylus comprising a cylindrical pen casing and an electrical resonant circuit, and having a pressure sensitive structure for sensing the depressing force

by using a change of an inductance generated by an interval displacement between a first magnetic body and a second magnetic body having a coil wounded around thereof, wherein said stylus comprising:

a depressing member having a contact portion for receiving said pen pressure and a rear end portion located on the substantially opposite side of said contact member, said rear end portion forming a first magnetic body,

a second magnetic body having a coil wound around which is disposed to its front end plane being located at a predetermined distance from a rear end plane of said rear end portion forming said first magnetic body,

an elastic material member disposed between said rear end portion forming said first magnetic body and said front end plane of said second magnetic body,

first supporting means disposed so as to hold the position of said second magnetic body against the pen pressure which is transferred from said depressing member and said elastic member, and

second supporting means for supporting said depressing member in a condition established when said rear end plane of said rear end portion forming said first magnetic body and said front end plane of said second magnetic body are placed with each other not in a parellel position by receiving said pen pressure.

8. The stylus as claimed in Claim 7, wherein said second supporting means comprises a peripheral portion of an opening of said casing, at least part of said peripheral portion comprising said second supporting means by contacting said depressing member.

9. The stylus as claimed in Claim 7, further comprising a support adjustment structure for adjusting the position of said second supporting means, said second supporting means being allowed to move forward and backward with said depressing member being held in contact state, so that said rear end plane of said rear end portion forming said first magnetic and said front end of said second magnetic body are held parallel to each other, and determines the initial gap between these two end planes when the pen is free from its depressing force.

10. The stylus as claimed in Claim 7, wherein said depressing member comprises a lock mechanism for fixing said support adjustment structure to hold a distance between said two magnetic bodies, which is defined by said supporting structure.

11. The stylus as claimed in Claim 7, wherein said depressing member comprises a tapered member including said contacting member and a plate formed by said first magnetic body.

12. The stylus as claimed in Claim 7, wherein said elastic material member comprises a diaphragm, which is fabricated by a film of a convex shape.

13. The stylus as claimed in Claim 7, wherein said elastic material member comprises a rubber sheet.

14. The stylus as claimed in Claim 7, wherein said depressing member comprises a tapered member including said contacting member and a plate forming said first magnetic body,

said second supporting means comprises a suspending rod for coupling said rear plane of said pen point member and said front panel of said second magnetic body, and

said suspending rod is threaded through a penetrating hole provided in said first magnetic body and said elastic material member, and assembled with loading a predetermined tension thereon such that said rear end plane of said rear portion of said first magnetic body and said front end of said second magnetic body are being held in parallel with each other, and determines the initial gap between these two end planes when the pen is free from its depressing force.

15. The stylus as claimed in Claim 14, wherein said suspending cord is formed integrally with said pen tip member.

16. The stylus as claimed in Claim 14, wherein said suspending cord is fabricated by thread.

17. The stylus as claimed in Claim 7,wherein said depressing member comprises a tapered member including said contacting member and a plate forming said first magnetic body,

said second supporting means comprises a suspending rod for coupling said rear plane of said pen point member and said front panel of said second magnetic body, and

said suspending rod is threaded through a penetrating hole provided in said first magnetic body and said elastic material member, and be assembled by loading a predetermined tension thereon such that said rear end plane of said rear portion of said first magnetic body and said front end of said second magnetic body are being held parallel to each other, and determines the initial gap between these two end planes when the pen is free from its depressing force.

18. The stylus as claimed in Claim 17, wherein said suspending rod is formed integrally with said pen tip member.

19. The stylus as claimed in Claim 18, wherein said suspending rod has a stopper mechanism, and said second magnetic body has a ring shaped flat plate covering a cavity drilled in the front end of said second magnetic body and an opening said cavity, and said suspending rod is coupled to said second magnetic body in a condition in which said stopper mechanism is threaded through said ring of said flat plate provided in said second magnetic body.

20. The stylus as claimed in Claim 17, wherein said elastic material is formed by ferrite rubber, into which a magnetic material is dispersed.

21. The stylus comprising a cylindrical pen casing and an electrical resonant circuit, and having a pressure sensitive structure for sensing the depressing force by using a change of an inductance generated by an interval displacement between a first magnetic body and a second magnetic body having a coil wound around thereof, wherein said stylus comprising:

a pen tip member having a contact portion for receiving said pen pressure and a rear end plane located on the substantially opposite side of said contact portion,

a second magnetic body having a coil wound around which is disposed so as to its front end plane being located at a predetermined distance from a rear end plane of said pen tip member,

an elastic material member, into which magnetic material is dispersed to form a first magnetic body, disposed between said rear end plane of said pen tip member and said front end plane of said second magnetic body,

first supporting means disposed to hold the position of said second magnetic body against the pen pressure that is transferred from said pen tip member and said elastic member, and

second supporting means for supporting said pen tip member in a condition established when said rear end plane of said pen tip and said end plane of said second magnetic body are placed with each other not in a parellel position by receiving said pen pressure.

22. The stylus as claimed in Claim 21, wherein said elastic material member into which said magnetic material is dispersed comprises ferrite rubber.

23. The stylus comprising a cylindrical pen casing and an electrical resonant circuit, and having a pressure sensitive structure for sensing the depressing force by using a change of an inductance generated by an interval displacement between a first magnetic body and a second magnetic body having a coil wounded around thereof, wherein said stylus comprising:

a pen tip member having a contact portion for receiving said pen pressure and a rear end plane located substantially opposite side of said contact member,

a second magnetic body having a coil wound around which is disposed to its front end plane being located at a predetermined distance from a rear end plane said pen tip member,

a plurality of magnetic discs, each of which is connected by elastic adhesive to compose a first magnetic body, disposed between said rear end plane of said pen tip member and said front end plane of said second magnetic body,

first supporting means disposed to hold the position of said second magnetic body against the pen pressure that is transferred from said pen tip member and said plurality of said magnetic discs, and

second supporting means for supporting said pen tip member in a condition established when said rear plane of said pen tip member and said front end plane of said second magnetic body are placed in each other not in a parellel position by receiving said pen pressure.

24. A stylus comprising a cylindrical pen casing and an electrical resonant circuit, and having a pressure sensitive structure for sensing the depressing force by using a change of an inductance of a coil wounded around a magnetic body, wherein said stylus comprising:

a pen tip member having a contact portion for receiving said pen pressure and a rear end plane located substantially opposite side of said contact member,

a plurality of magnetic cylinders having a coil wounded around thereof, said cylinders being disposed so as to contact with the rear end plane of said pen tip member, and connected by elastic adhesive to each other,

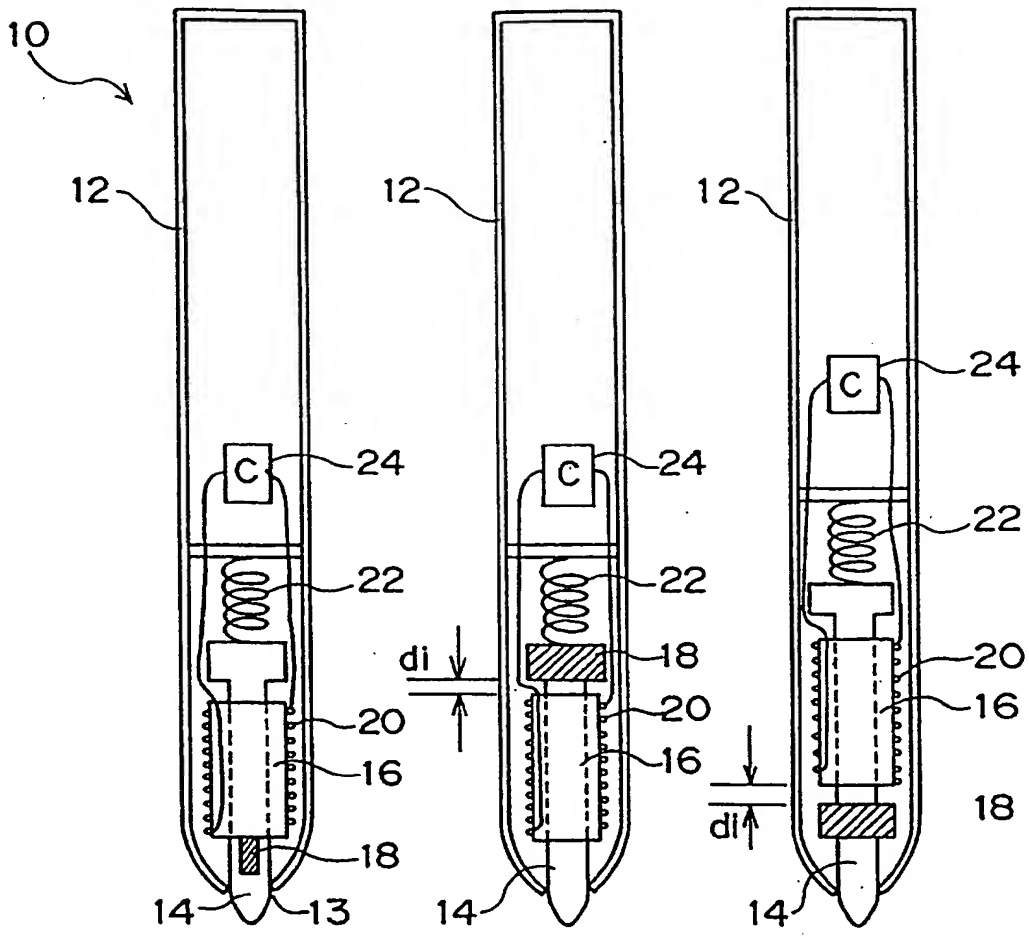
first supporting means disposed to hold the position of the cylinder disposed at most rear end of said cylinders against the pen pressure transferred from said pen tip member and said plurality of said magnetic cylinders, and

second supporting means for supporting said pen tip member in a condition established when said rear plane of said pen tip member and said end planes of said cylinders are placed with each other not in a parellel position by receiving said pen pressure.

25. A pressure sensitive arrangement or stylus comprising means for sensing a change in an inductance generated between first and second magnetic bodies in which an elastically deformable member,

which may or may not be magnetic, is disposed between or forms part of one of the first and second magnetic bodies.

Fig. 1A Fig. 1B Fig. 1C



Prior Art Prior Art Prior Art

Fig. 2

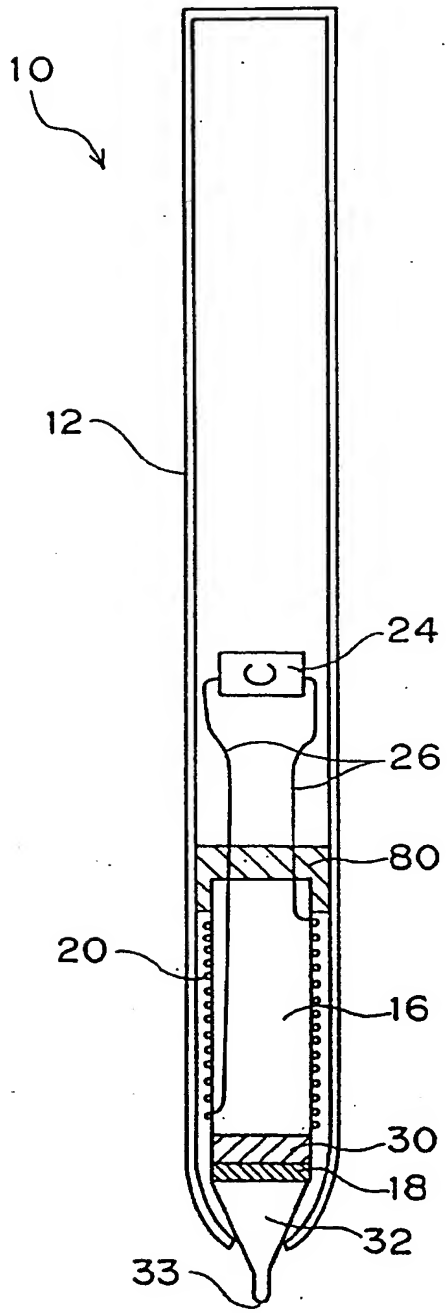


Fig. 3B

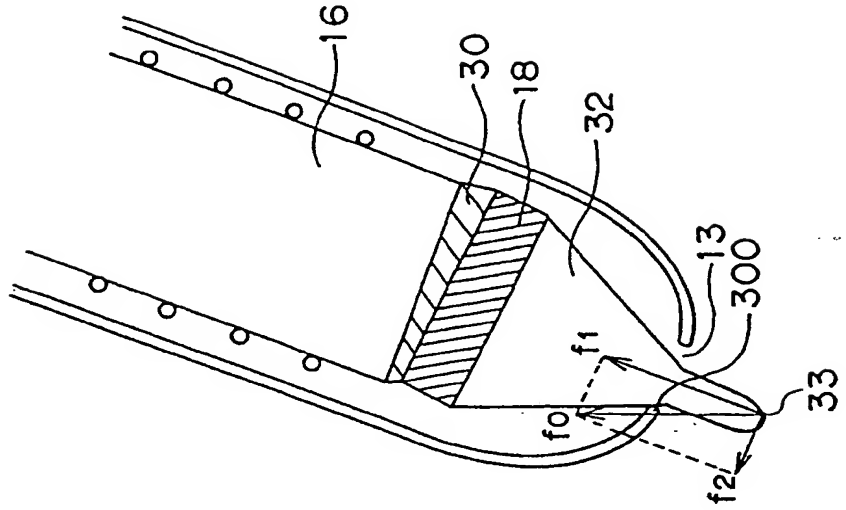


Fig. 3A

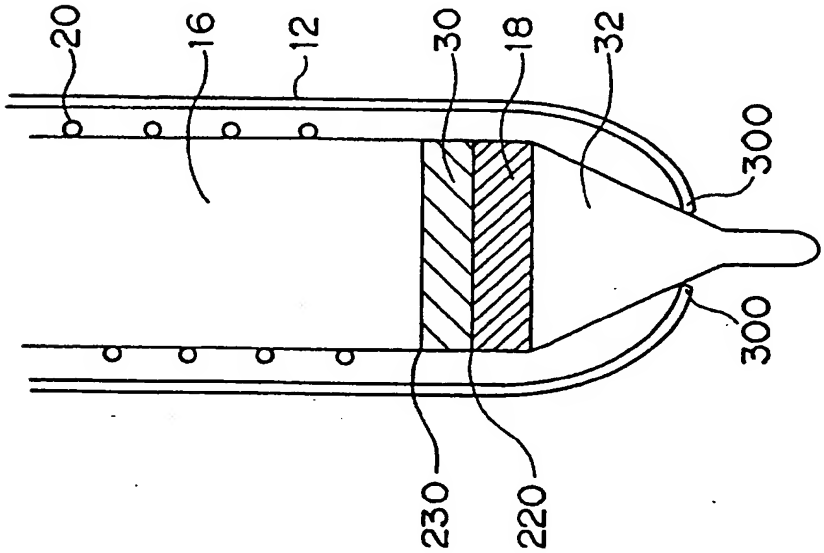


Fig. 4

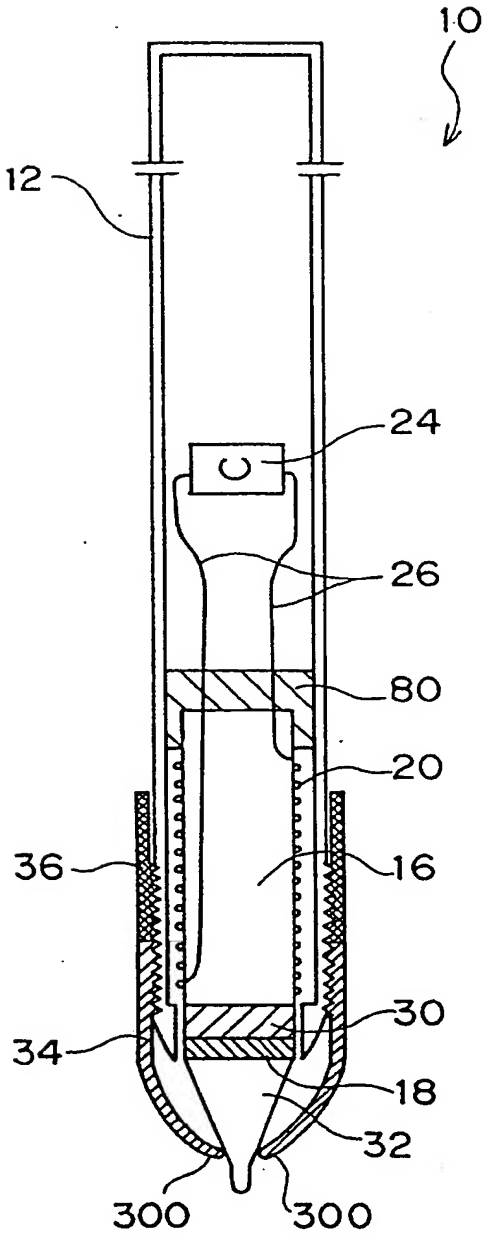


Fig. 5

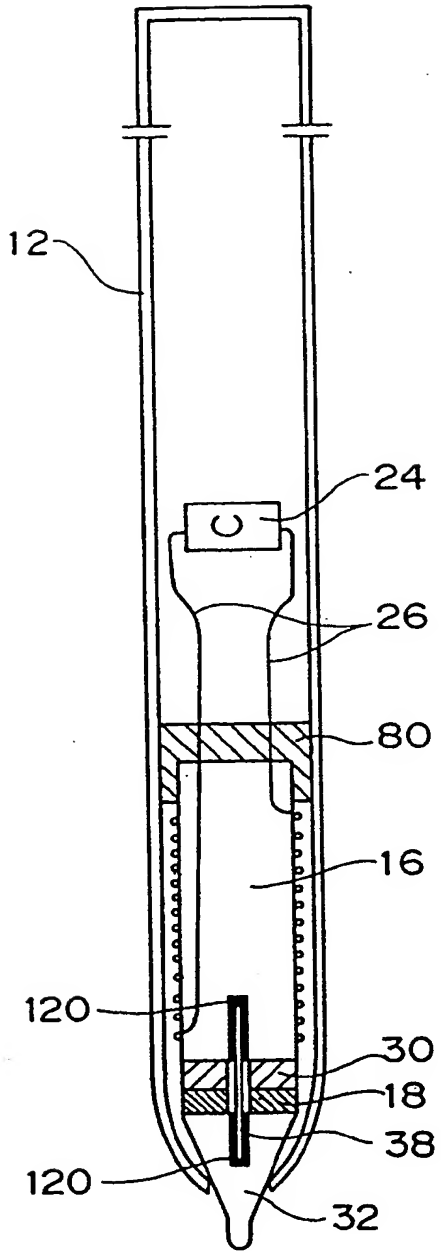


Fig. 6

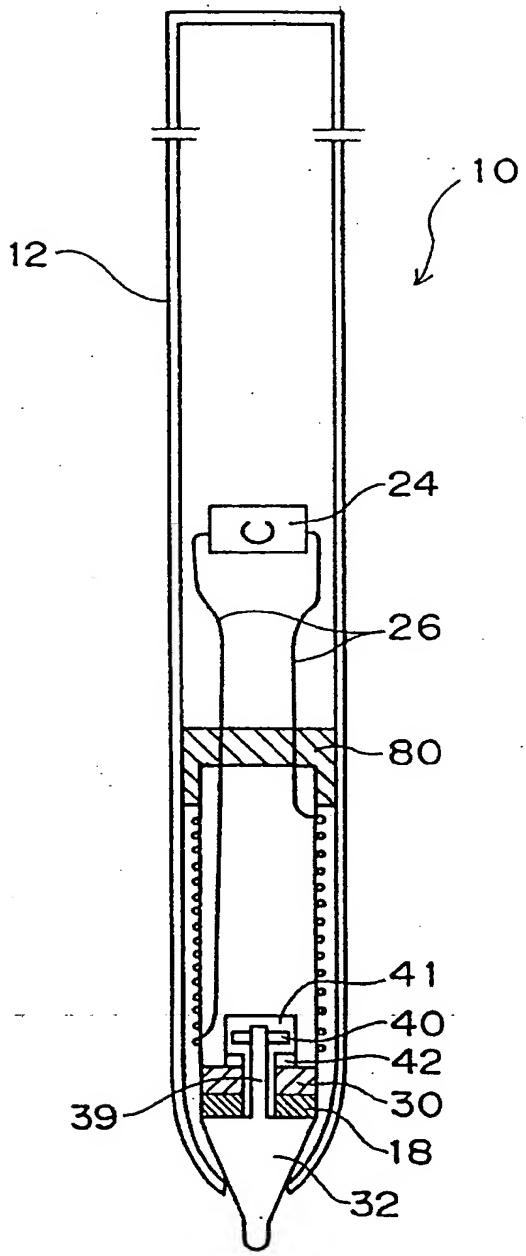
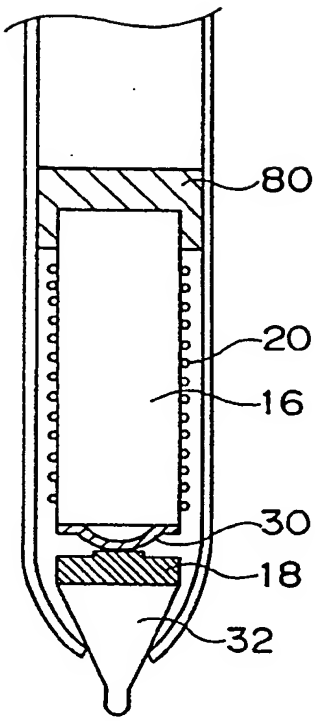


Fig. 7



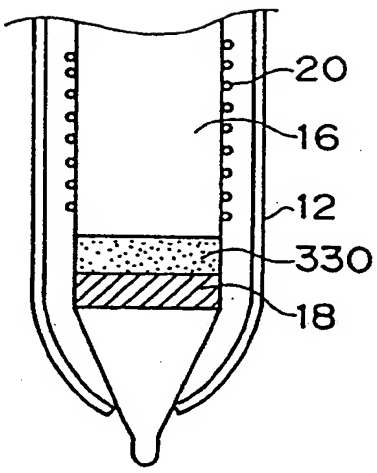


Fig. 8A

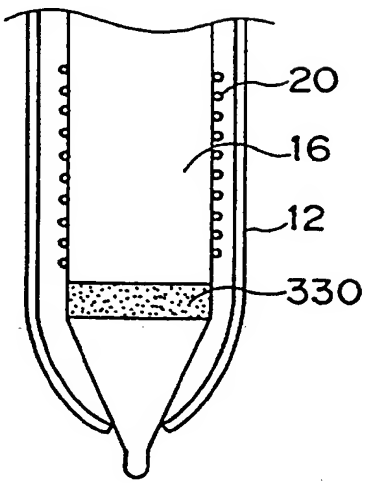


Fig. 8B

Fig. 9A

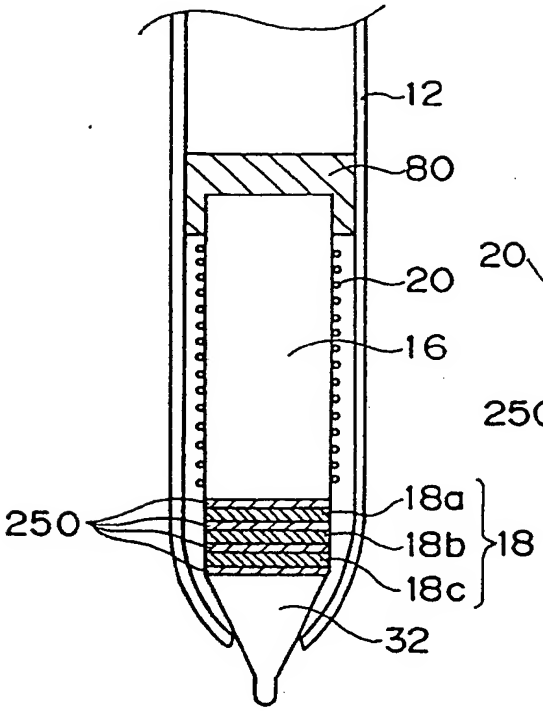
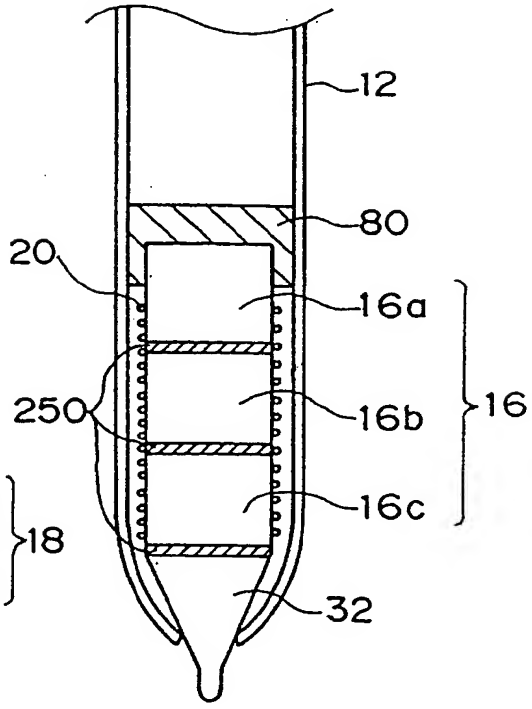


Fig. 9B



European Patent Office

EUROPEAN SEARCH REPORT

Application Number
EP 95 30 3448

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.6)
X	PATENT ABSTRACTS OF JAPAN vol. 10, no. 338 (P-516), 15 November 1986 & JP-A-61 139820 (SEIKO INSTR & ELECTRONICS LTD), 27 June 1986, * abstract *	1-11, 23-25	G06K11/18
A	PATENT ABSTRACTS OF JAPAN vol. 8, no. 204 (P-301), 18 September 1984 & JP-A-59 087586 (MATSUSHITA DENKI SANGYO KK), 21 May 1984, * abstract *	1-25	
A	WO-A-88 05576 (TERMINAL DISPLAY SYSTEMS LIMITED) 28 July 1988 * page 3, line 25 - page 4, line 11; figure *	1-25	
A	US-A-4 896 543 (GULLMAN) 30 January 1990 * column 2, line 23 - line 33 * * column 2, line 61 - column 3, line 2 *	1-25	
			TECHNICAL FIELDS SEARCHED (Int.Cl.6) G06K

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	12 June 1996	Nygren, P

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
Y : particularly relevant if combined with another document of the same category
A : technological background
O : non-written disclosure
P : intermediate document

T : theory or principle underlying the invention
E : earlier patent document, but published on, or after the filing date
D : document cited in the application
L : document cited for other reasons

& : member of the same patent family, corresponding document

EPO FORM 1503 03.82 (P04C01)